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WATER QUALITY COMPARISON STUDY

ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS

ENVIRONMENTAL PROTECTION AGENCY

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WATER QUALITY COMPARISON STUDY
ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS

Environmental Protection Agency
Region IV
Surveillance and Analysis Division
Athens, Georgia

January 1972

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A limited survey was conducted to produce data for use in comparing water quality (including nutrient quality) of the Escambia River with other streams in the Northwest Florida area. Of particular interest were the relative nitrogen, phosphorus and organic concentrations.

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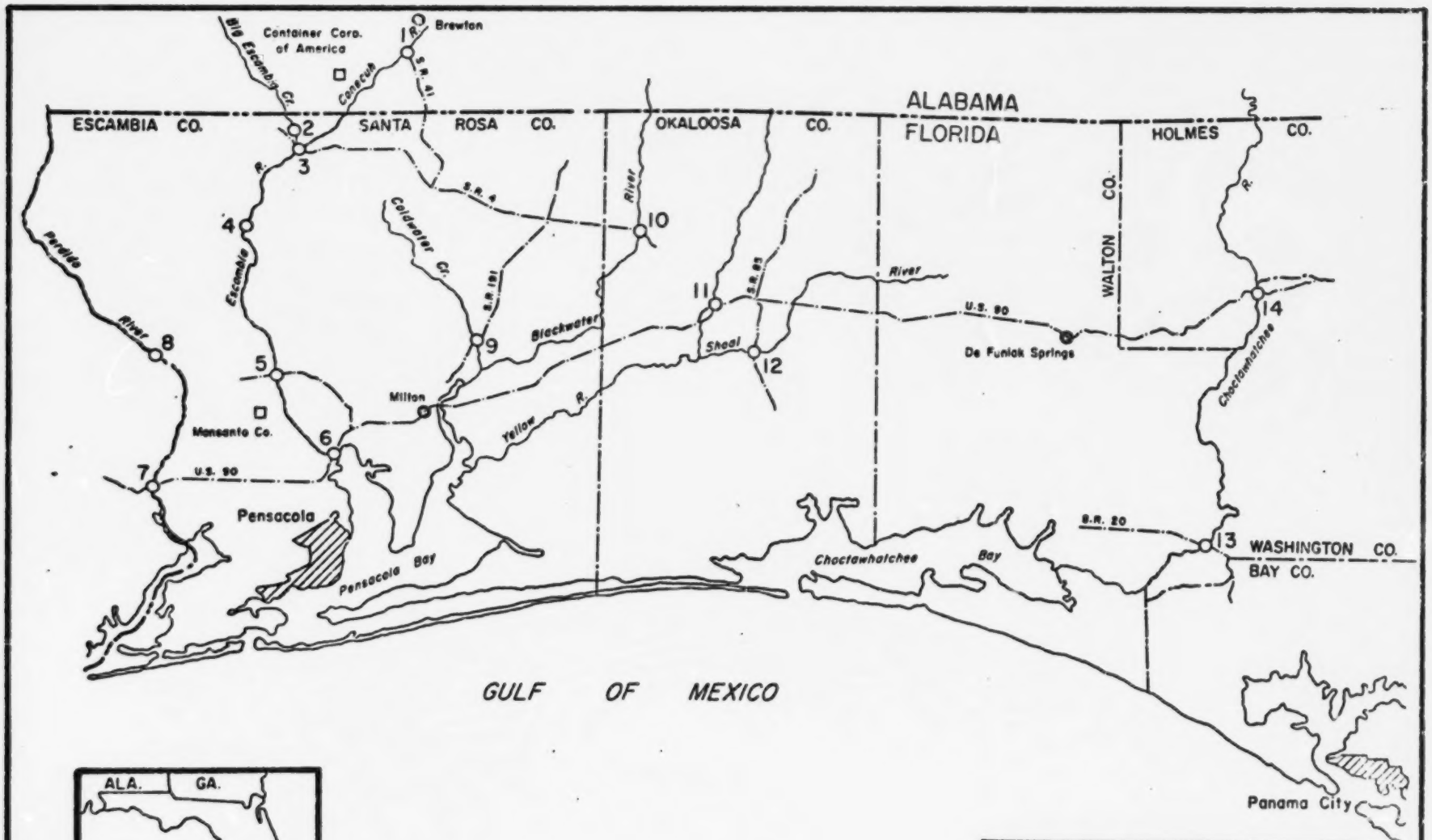
INTRODUCTION

In October 1971, the Southeast Region of the Environmental Protection Agency (EPA) received a request for technical assistance in comparing nutrient concentrations in the Escambia River watershed with other streams in the northwest Florida area. A meeting was held in Atlanta between EPA, the Florida Department of Pollution Control (FDPC), and Alabama Water Improvement Commission (AWIC) personnel to prepare for the third session of the Escambia River Conference planned for January, 1972. Because of extensive recent studies in the Conecuh-Escambia River and Bay it was decided that very little additional field work was necessary. A limited survey was planned to produce data for use in comparing water quality (including nutrient quality) of the Escambia River with other streams in the Northwest Florida area. Of particular interest were the relative nitrogen, phosphorus and organic concentrations. A cooperative study was conducted from November 22 to December 6, 1971 by FDPC and EPA. Florida personnel collected samples and performed the analysis for all reported parameters except nitrogen phosphorus and TOC in their Pensacola laboratory. Nutrient analyses were completed at the Southeast Water Laboratory in Athens, Georgia.

DESCRIPTION OF AREA

The study area lies between and includes the Perdido and Choctawhachee River Basins in Northwest Florida (Figure 1). Streams in this area drain the Florida panhandle and extreme Southern Alabama. Land use in the northern portions of the Escambia, Yellow and Choctawhatchee Basins is primarily agricultural with timber covered areas predominating in the southern portion. All streams under consideration except the Conecuh-Escambia



SITE PLAN

KEY

O Sampling Station

SCALE IN MILES

5 0 5 10 15

N

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

STATIONS LOCATIONS
NORTHWEST FLORIDA STREAMS

SURVEILLANCE & ANALYSIS DIVISION
ATHENS GEORGIA

FIGURE 1

receive relatively small quantities of domestic or industrial wastes and can be classified as clean streams, particularly in the reaches covered by this survey. Drainage areas upstream from some of the sampling stations are:

Sta. No. 3, Escambia River, Florida, Highway # 4, 3817 sq. mi.

Sta. No. 13, Choctawhatchee River, Florida, Highway # 20, 4384 sq. mi.

Sta. No. 14, Choctawhatchee River, U. S. Highway # 90, 3499 sq. mi.

Sta. No. 11, Yellow River, U. S. Highway # 90, 624 sq. mi.

Sta. No. 12, Shoal River, Florida, Highway # 85, 474 sq. mi.

Sta. No. 8, Perdido River, Barrineau Park, 394 sq. mi.

DISCUSSION OF RESULTS

One grab sample per week at mid water depth was taken for three consecutive weeks from 14 locations. Streamflows in the area were unusually low when the first set of samples were collected but increased progressively on two additional runs as a result of locally heavy rainfall. Flow information was provided by the U. S. Geological Survey. Figure 1 shows the sampling stations and Appendix A lists the tabulated study data. Appendix B shows average values for data collected by EPA or its predecessor agencies between 1966 and 1971. These data were retrieved from STORET[1/] and represent part of the water quality record for these stations. Figures 1 through 9 are graphs of both the recent and STORET water quality data. Minor variations were observed in comparing water quality of these streams. The following are general obser-

1/ STORET is a computerized system for storage and retrieval of water quality data.

FIGURE 2
FLOW DURING STUDY PERIOD
PLUS AVERAGE FLOW FOR STORET DATA

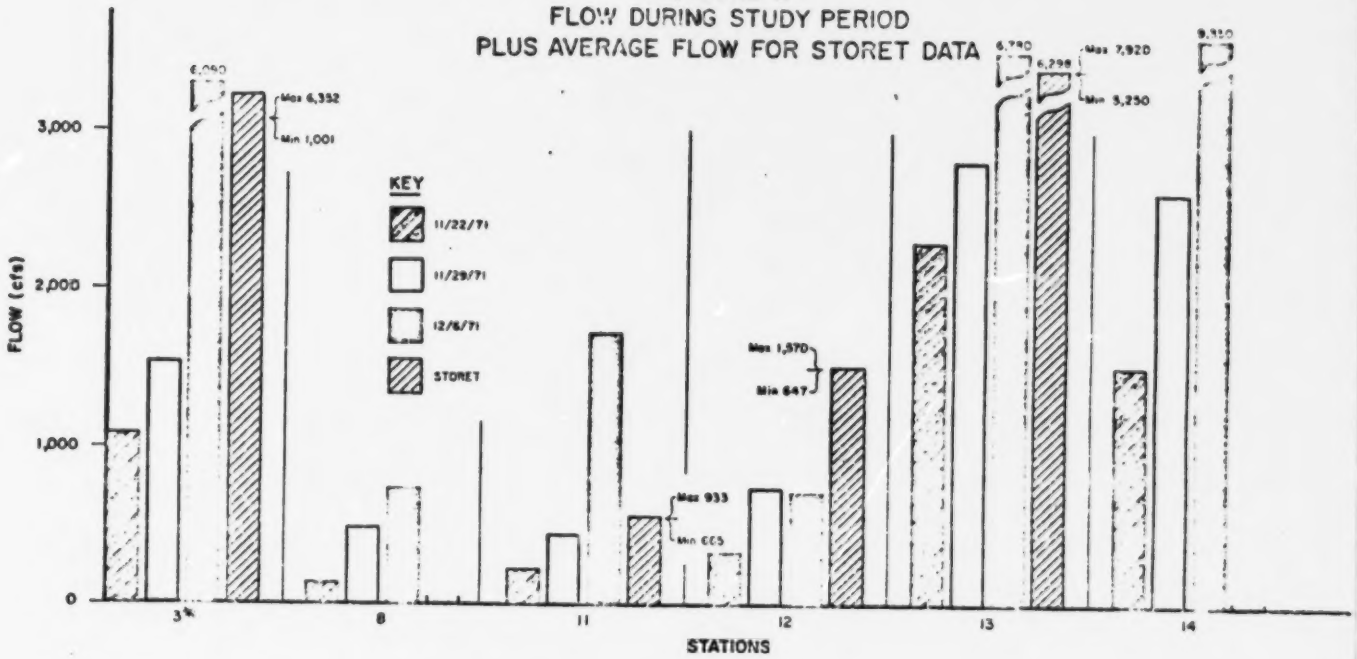
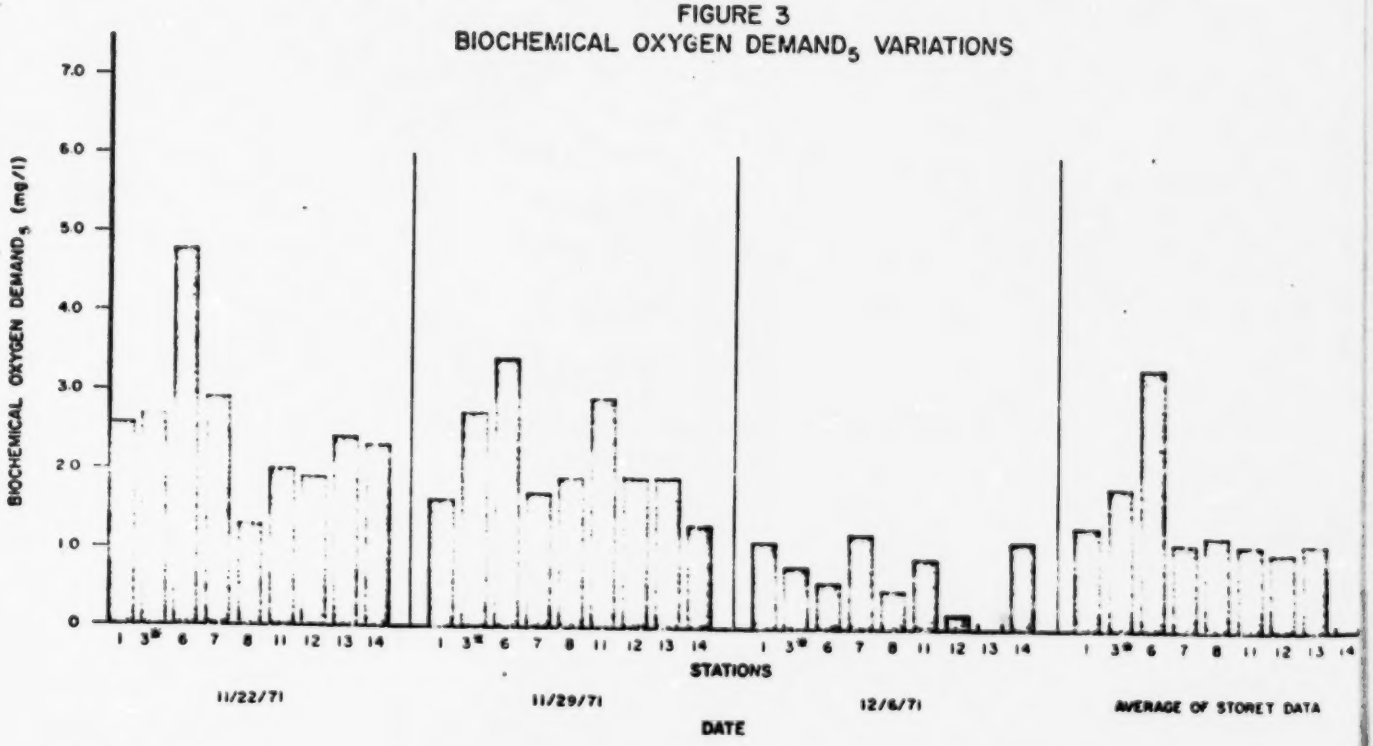


FIGURE 3
BIOCHEMICAL OXYGEN DEMAND$_5$ VARIATIONS



NOTE * ESCAMBIA RIVER AT CENTURY FLA.

FIGURE 4
PHOSPHORUS VARIATIONS

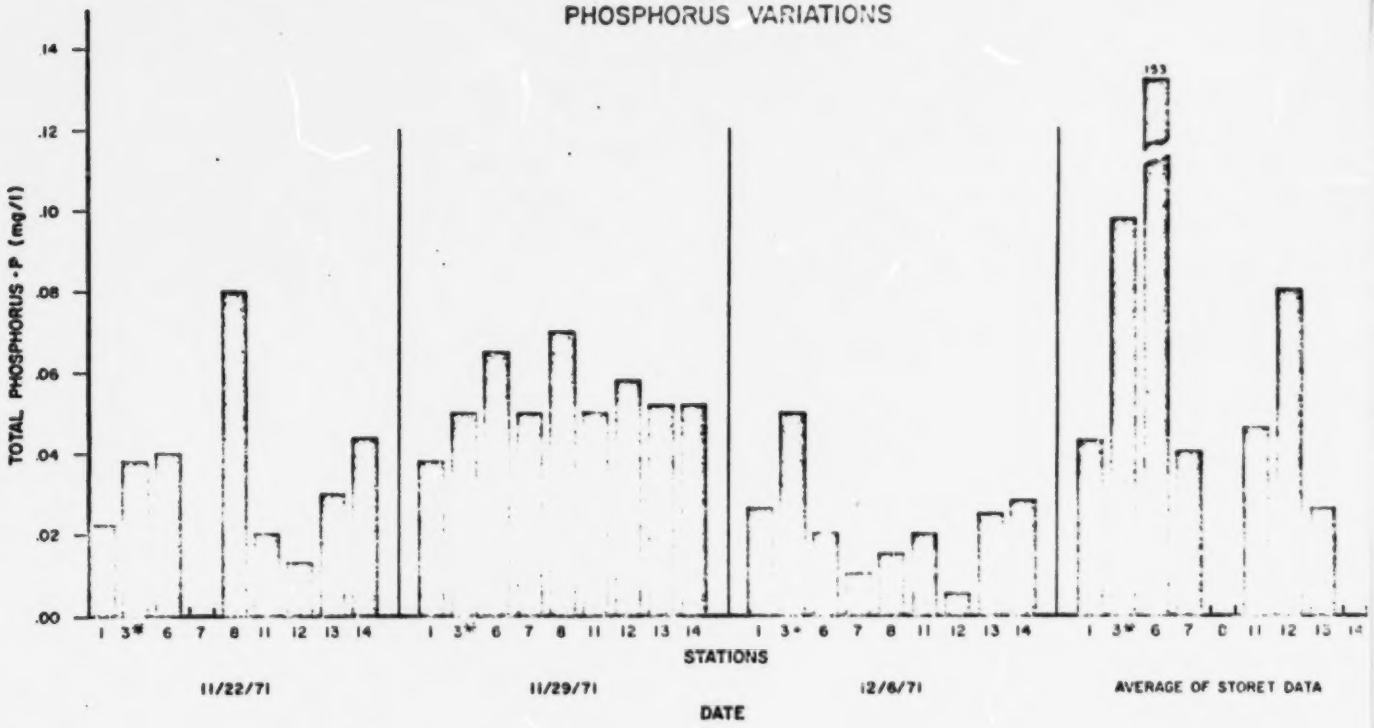
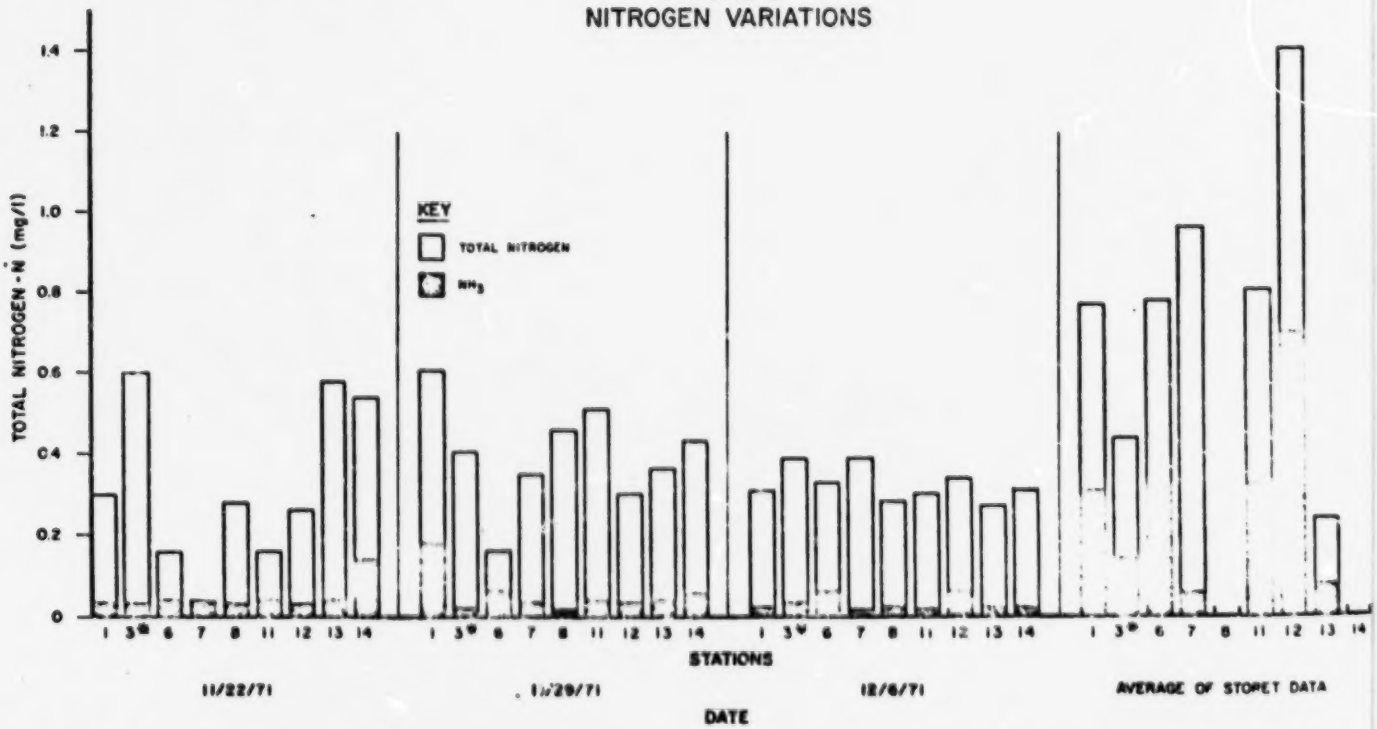


FIGURE 5
NITROGEN VARIATIONS



NOTE * ESCAMBIA RIVER AT CENTURY FLA.

FIGURE 6
COLOR VARIATIONS

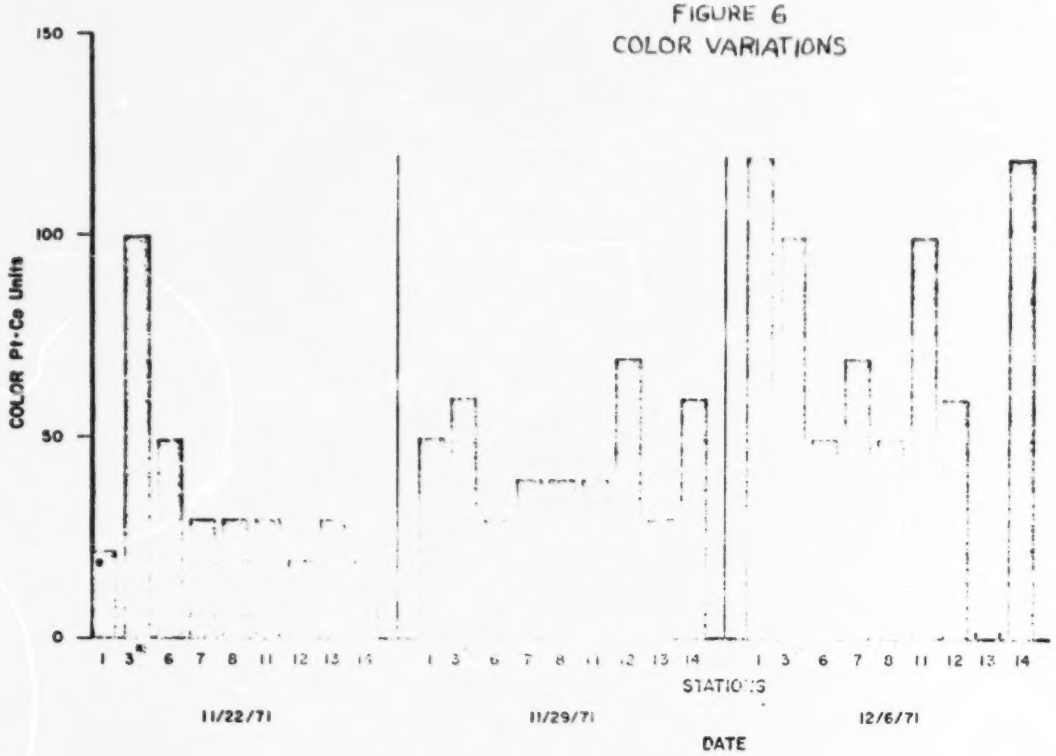
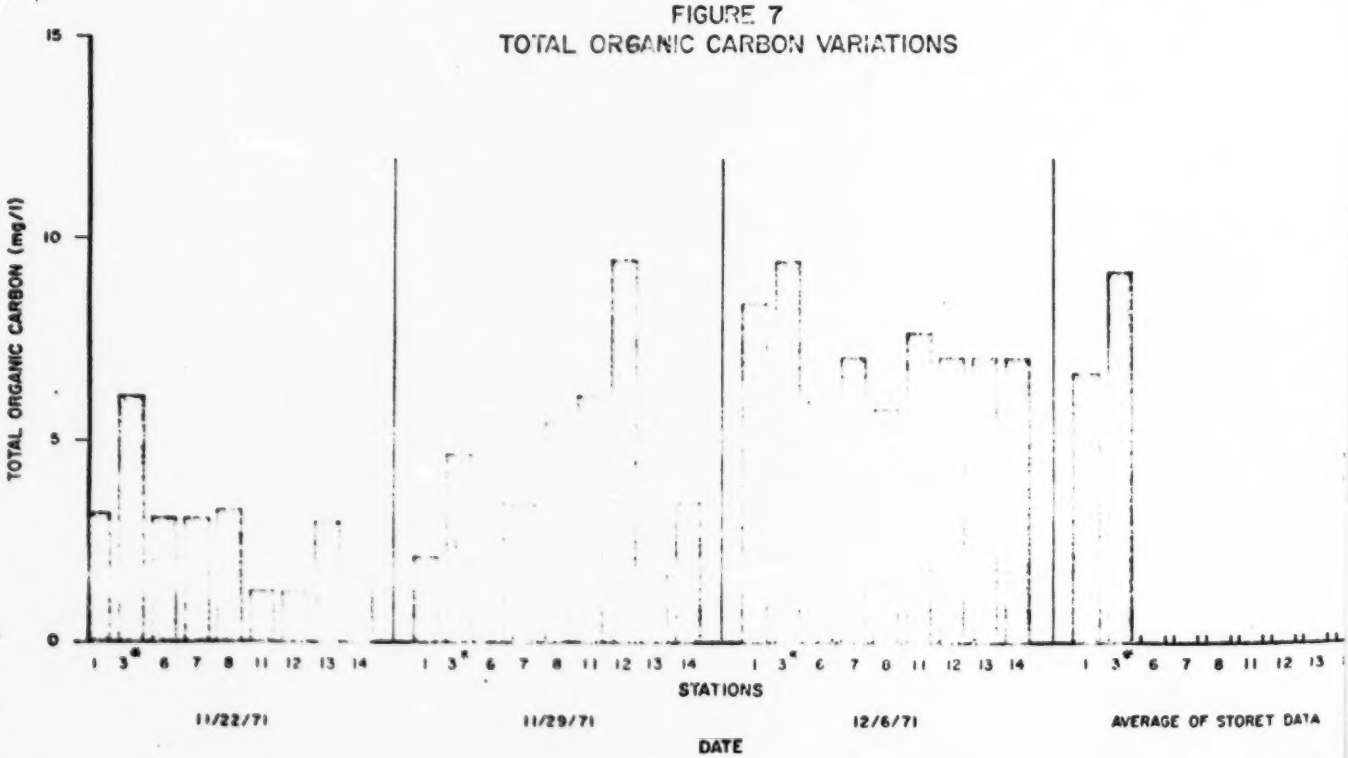


FIGURE 7
TOTAL ORGANIC CARBON VARIATIONS



NOTE * ESCAMBIA RIVER AT CENTURY, FLA.

FIGURE 8
TOTAL & DISSOLVED SOLIDS VARIATIONS

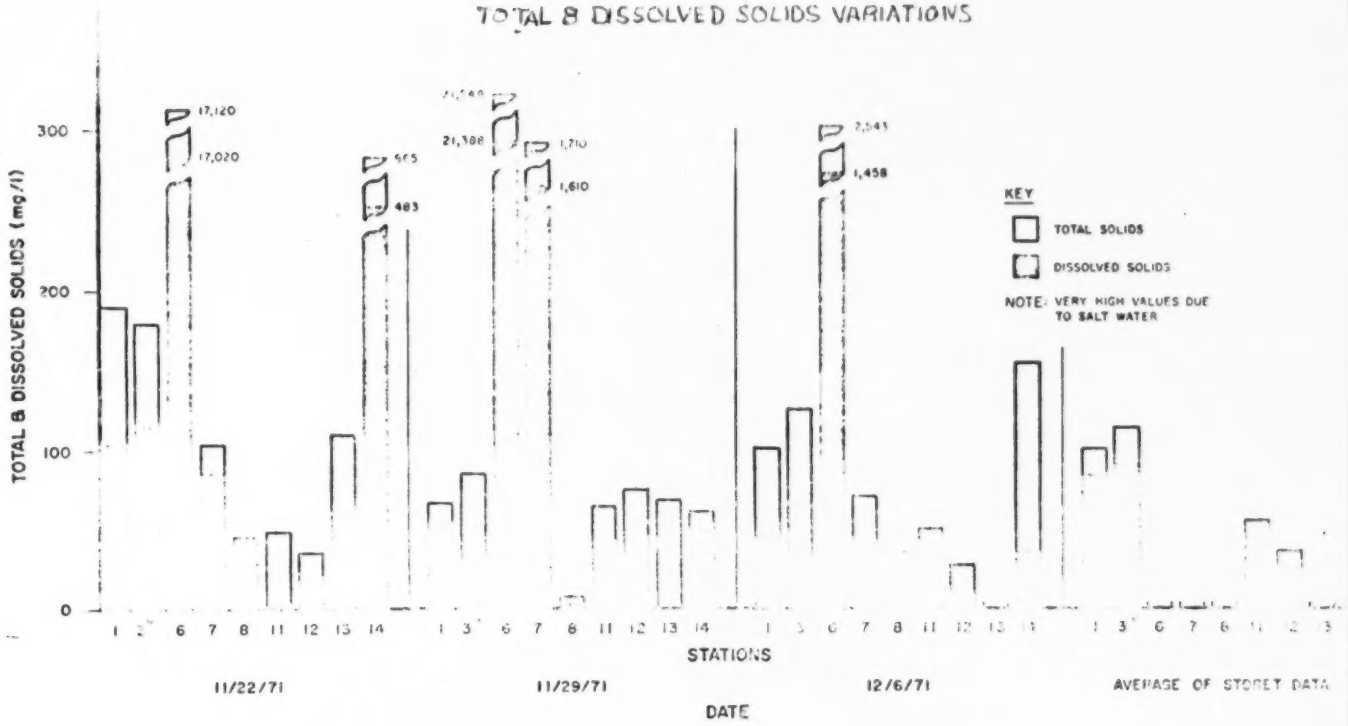
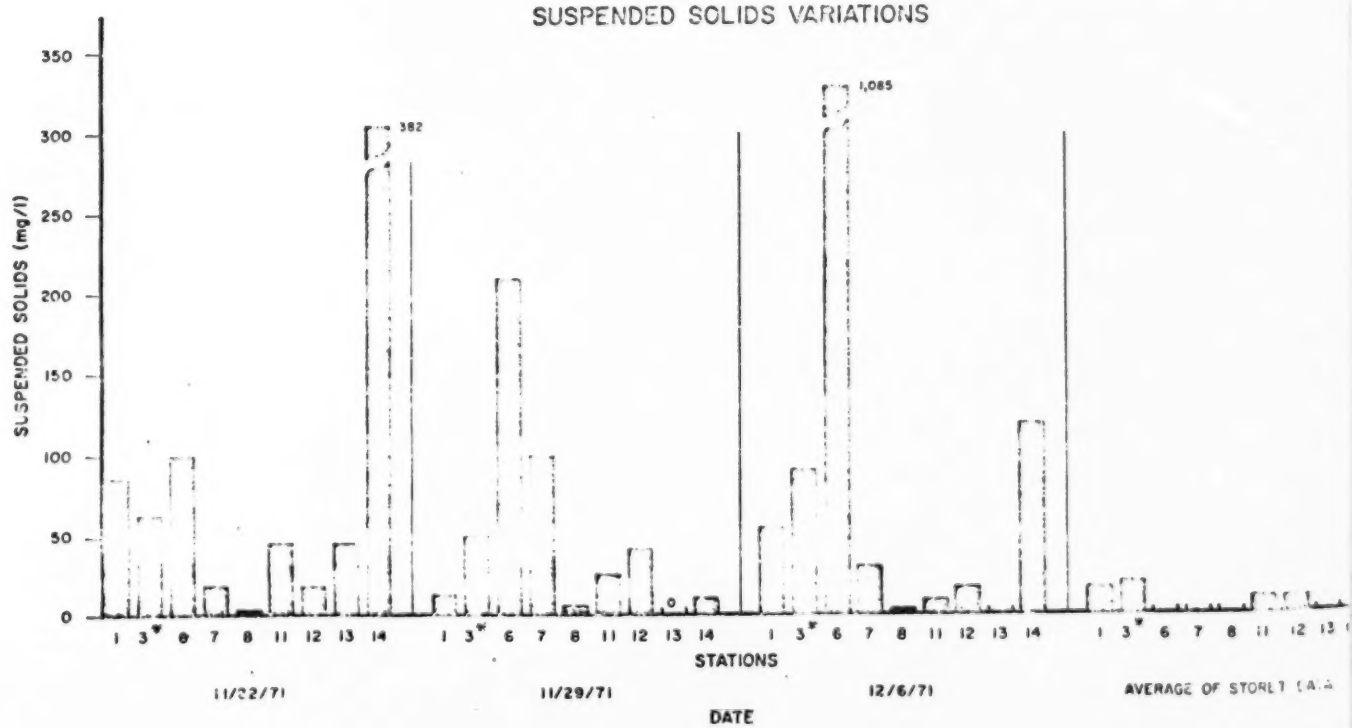


FIGURE 9
SUSPENDED SOLIDS VARIATIONS



NOTE * ESCAMBIA RIVER AT CENTURY, FLA.

vations taken from Figures 1 - 9.

Five-day Biochemical Oxygen Demand (BOD_5)

1. The BOD_5 concentrations varied inversely with flow.
2. At low flow, the BOD_5 concentrations on the Escambia River at Station No. 3 were only slightly higher than in other study area streams.
3. A maximum 4.8 mg/l value recorded on 11/22/71 at Station No. 6 on the Escambia was downstream from Monsanto Company's waste outfall.
4. Most of the BOD_5 concentrations (except the 4.8 value) were less than or equal to ranges normally found in healthy streams.
5. STORET data are comparable to 1971 results.

Total Phosphorus

1. During the 1971 study, Escambia River phosphorus concentrations were similar to those of other streams. One higher phosphorus value at Station 3 on December 6, 1971, could have resulted from upstream waste discharges, but the high flow on this date tends to preclude this possibility.
2. The slightly higher values from STORET are probably due to seasonal variations, in rainfall and streamflow, and/or improved waste treatment practices since 1966.

Total Nitrogen

1. During the 1971 study, Escambia River nitrogen concentrations were

generally similar to those of other streams. The one low flow elevated value (0.6 mg/l) at Station 3 (11/22/71) would appear to result from upstream waste discharges, although Station 4 downstream showed a substantial decrease (0.31 mg/l).

2. Phosphorus comment (2) above applies.

Color

1. Color increased with flow. This is probably caused by discharge of highly colored water from storage in swamp and marshy areas.
2. Evidence of paper mill waste can be detected at Station No. 3 on the Escambia at low flows.
3. At higher flows the Conecuh and Choctawhatchee Rivers had more color than the Escambia.

Total Organic Carbon (TOC)

1. All TOC values were relatively low (<10 mg/l).
2. Some increase in TOC values downstream from Brewton, Alabama, and Container Corporation discharges were noted, although on November 29, 1971, there were much higher concentrations in other study area streams.
3. TOC values increased with streamflow.

Solids

1. High solids observed on river stations closest to the Gulf are influenced by salt water intrusion.
2. At low flow, solids were higher on the Escambia than in other study streams.

3. Solids concentrations at Station No. 3 on the Escambia and Station No. 1 on the Conecuh are essentially the same.
4. Solids did not vary appreciably with flow for the range of flows covered in the 1971 study.

CONCLUSIONS

1. Although the 1971 study was not an exhaustive investigation, there is strong evidence that quality among all the streams studies is comparable. Seasonal trends and effects of rainfall and runoff can be better defined by a long term monitoring program.
2. At low flow, the results of waste discharges from the Container Corporation-Brewton, Alabama area are evident in the increased color and TOC values between Station 1 and 3.
3. STORET data shows comparable water quality among the streams selected for study.
4. When concentrations for various water quality constituents studied are converted to loading (lbs/day), there will be an appreciable difference among river basins in the study area. Loading is a function of streamflow which varies among the study streams. Differences among the estuarine ecosystems for each river basin are to be expected -- possibly as a result of differing streamflow. Enforcement actions, however, should be formed on controllable factors rather than on effect of flow which is largely a natural phenomenon.

Appendix A

Escambia River Comparitive Study
Summary of Data

Sta. No.	Stream and Location	Date (1971)	Flow cfs	Temp °C	DO mg/l	BOD_5 mg/l	Turb. JCU	COD mg/l	pH Field	Color Pt-Co Units	Total Solids mg/l	Dissolved Solids mg/l	Coliform MPN/100 ml	TKN mg/l	NH_3-N mg/l	NO_2+NO_3-N mg/l	Total Phos-P mg/l	T my
1	Conecuh R.-	11/22		13.0	10.1	2.6	16	19.0	7.2	20	191	105	1,600	0.15	0.03	0.15	0.[illegible]	[illegible]
	Hwy #41	11/29		13.6	9.8	1.6	22	26.6	7.2	50	69	55	920	0.32	0.17	0.29	0.[illegible]	[illegible]
		12/6		10.9	10.4	1.1	85	11.4	6.9	120	103	48	>2,400	0.18	0.02	0.13	0.[illegible]	[illegible]
2	Big Escambia Cr.-	11/22		12.0	9.4	1.9	31	4.0	6.4	50	262	259	--	0.14	0.04	0.13	0.[illegible]	[illegible]
	Near mouth	11/29		13.0	9.0	1.7	11	7.6	6.6	40	30	21	13,000	0.25	0.30	0.17	0.[illegible]	[illegible]
		12/6		11.5	12.2	0.8	10	7.6	6.2	60	25	8	1,600	0.25	0.02	0.09	0.[illegible]	[illegible]
3	Escambia R. -	11/22	1,080	13.6	8.2	2.7	42	11.0	6.9	100	180	117	>2,400	0.47	0.03	0.13	0.[illegible]	[illegible]
	Hwy. No. 4	11/29	1,520	13.8	8.7	2.7	13	22.8	6.8	60	87	36	3,300	0.29	0.01	0.12	0.[illegible]	[illegible]
		12/6	6,090	12.0	7.4	0.8	90	15.2	6.6	100	127	35	>2,400	0.22	0.03	0.17	0.[illegible]	[illegible]
4	Escambia R. -	11/22		13.8	8.8	2.0	44	7.0	6.8	70	189	130	540	0.16	0.04	0.15	0.[illegible]	[illegible]
	McDavid Landing	11/29		12.8	9.0	1.9	14	7.6	7.0	40	78	77	3,300	0.18	0.06	0.12	0.[illegible]	[illegible]
		12/6		10.5	10.7	0.3	70	15.2	6.8	70	100	43	>2,400	0.18	0.06	0.14	0.[illegible]	[illegible]
5	Escambia R. -	11/22		14.8	8.6	2.2	28	11.0	6.9	60	--	--	>2,400	0.23	0.03	0.14	0.[illegible]	[illegible]
	Hwy. No. 184	11/29		13.5	8.7	1.0	14	11.4	6.8	60	70	59	2,300	0.18	0.02	0.12	0.[illegible]	[illegible]
		12/6		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	Escambia R. -	11/22		18.5	6.6	4.8	21	chlo-	8.8	50	17,120	17,020	>2,400	0.32	0.04	0.07	0.[illegible]	[illegible]
	Hwy. No. 90	11/29		16	8.3	3.4	5	ride	8.8	30	21,548	21,338	4,900	0.19	0.06	0.07	0.[illegible]	[illegible]
		12/6		12	9.6	0.6	20	inter-	6.8	50	2,583	1,458	>2,400	0.22	0.06	0.11	0.[illegible]	[illegible]
								ference										
7	Perdido R. -	11/22		--	--	2.9	25	chlo-	6.8	30	105	87	350	--	0.04	0.09	--	[illegible]
	Hwy No. 90	11/29		14.5	7.9	1.7	8	ride	6.4	40	1,710	1,610	24,000	0.22	0.03	0.13	0.[illegible]	[illegible]
		12/6		12.0	9.8	1.2	43	inter-	6.2	70	73	42	>2,400	0.28	0.01	0.11	0.[illegible]	[illegible]
8	Perdido R. -	11/22	145	13.5	9.4	1.3	34	7.0	6.4	30	47	43	350	0.17	0.03	0.11	0.[illegible]	[illegible]
	Barrineau Park	11/29	496	13.2	8.7	1.9	18	15.2	6.2	40	10	4	13,000	0.28	0.01	0.18	0.[illegible]	[illegible]
		12/6	727	13.0	10.2	0.5	22	11.4	5.4	50	38	35	>2,400	0.19	0.02	0.09	0.[illegible]	[illegible]
9	Big Coldwater Cr.-	11/22	257	12.5	10.2	7.1	18	30.0	6.4	50	236	219	350	0.22	0.01	0.32	0.[illegible]	[illegible]
	Hwy. No. 191	11/29	572	14.6	9.6	3.4	25	19.0	6.1	30	31	30	1,600	0.24	0.05	0.28	0.[illegible]	[illegible]
		12/6	478	14.9	9.7	0.7	3	19.0	6.1	20	32	15	540	0.17	0.03	0.22	0.[illegible]	[illegible]
10	Blackwater R. -	11/22	96	12.0	10.5	2.1	13	19.0	6.4	30	30	30	79	0.08	0.02	0.08	0.[illegible]	[illegible]
	Hwy. No.4	11/29	310	13.8	9.7	1.8	30	30.4	6.0	60	66	49	>2,400	0.38	0.17	0.29	0.[illegible]	[illegible]
		12/6	350	13.5	9.7	1.1	23	53.2	6.0	80	45	27	920	0.17	0.01	0.05	0.[illegible]	[illegible]
11	Yellow R. -	11/22	258	12.2	10.1	2.0	12	11.0	7.1	30	50	4	--	0.10	0.04	0.06	0.[illegible]	[illegible]
	Hwy. No. 90	11/29	497	14.4	9.9	2.9	32	7.6	6.9	40	68	41	>2,400	0.43	0.04	0.08	0.[illegible]	[illegible]
		12/6	1,760	11.1	9.7	0.9	40	57.0	6.4	100	52	42	>2,400	0.29	0.01	0.01	0.[illegible]	[illegible]
12	Shoal R. -	11/22	334	12.5	10.4	1.9	11	15.0	6.2	20	38	20	170	0.15	0.03	0.11	0.[illegible]	[illegible]
	Hwy. No. 185	11/29	735	14.3	10.0	1.9	50	7.6	6.2	70	77	36	>2,400	0.19	0.03	0.11	0.[illegible]	[illegible]
		12/6	714	13.0	9.6	0.2	7	7.6	5.9	60	29	10	>2,400	0.23	0.06	0.11	0.[illegible]	[illegible]
13	Choctawhatchee R.-	11/22	2,320	14.5	9.0	2.4	22	19.0	7.2	30	111	65	920	0.25	0.04	0.33	0.[illegible]	[illegible]
	Hwy. No. 20	11/29	2,820	14.8	8.6	1.9	6	11.4	7.2	30	71	71	>2,400	0.16	0.04	0.30	0.[illegible]	[illegible]
		12/6	6,290	--	--	--	--	--	--	--	--	--	--	0.21	0.02	0.06	0.[illegible]	[illegible]
14	Choctawhatchee R.-	11/22	1,550	13.0	9.5	2.3	10	19.0	6.8	20	993	583	540	0.22	0.14	0.32	0.[illegible]	[illegible]
	Hwy. No. [illegible]	11/29	2,550	13.3	8.9	1.3	25	19.0	7.0	60	53	--	--	0.16	0.05	0.27	0.[illegible]	[illegible]
		12/6	9,350	10.1	9.9	1.1	104	38.0	6.4	120	57	32	>2,400	0.20	0.02	0.11	0.[illegible]	[illegible]

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Appendix B

Escambia River Comparitive Study
Summary of Average STORET Data

Sta. No.	Stream and Location	Inclusive Dates	Flow cfs	Temp °C	DO mg/l	BOD_5 mg/l	Turb. JCU	COD mg/l	pH Field	Color Pt-Co Units	Total Solids mg/l	Dissolved Solids mg/l	Coliform MPN/100 ml	TKN mg/l	NH_3-N mg/l	NO_2+NO_3-N mg/l	Total Phos.-P mg/l	TO mg
1	Conecuh R.-Hwy. No. 41	4/24/68-8/28/70		26.3	7.8	1.3			7.0		101	83	2,775	0.66	0.31	0.11	0.042	6 7
2	Big Escambia Cr.-near mouth	4/24/68-7/2/71		23.7	7.5	1.3	32	12.0	6.0		51	35	16,252					8.3
3	Escambia R.-Hwy. No. 4	4/24/68-8/28/70	3,243	25.9	6.3	1.8	25		6.7		114	92	30,171	0.35	0.14	0.09	0.065	9.2
4	Escambia R.-McDavid Landing	4/28/68-6/28/68		24.4	5.9	1.1			6.8				7,085					
5	Escambia R.-Hwy. No. 184	4/24/68-8/28/70	4,677	25.5	6.3	1.4		15.1	6.6				12,381	0.30	0.13	0.12	0.052	8.8
6	Escambia R.-Hwy. No. 90	4/24/68-6/28/68		25.6	3.7	3.3			7.1		6,990	6,977	2,778	0.63	0.31	0.15	0.153	
7	Perdido R.-Hwy. No. 90	12/2/66-1/4/67		13.5	9.0	1.1			5.6				3,839	0.89	0.06	0.07	0.013	
8	Perdido R.-Barrineau Park	4/24/63-6/28/68		13.2	10.0	1.2			5.7				2,097					
9	Big Coldwater Cr.-Hwy No.191	2/18/66-6/9/66	685	17.5	9.5	0.8		10.8	6.0				2,325		0.37		0.026	
10	Blackwater R.-Hwy. No. 4	4/4/66-6/9/66	203	17.3	9.5	1.0		11.3	5.4		36	29	957		0.43		0.036	
11	Yellow R.-Hwy. No. 90	4/4/66-4/18/66	816	17.7	9.0	1.1		9.6	6.7		56	44	1,277	0.70	0.33	0.11	0.046	
12	Shoal R.-Hwy. No. 185	2/24/66 6/9/66	1,460	19.5	8.7	1.0		10.6	6.0		39	27	2,222		0.70		0.026	
13	Choctawhatchee R.-Hwy. No. 20	1/22/68-2/9/68	6,298	10.3	9.2	1.1			7.4				909	0.23	0.08	0.11	0.026	